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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 09/785,944
Filing Date: February 16, 2001
Appellant(s): FERMANN, MARTIN E.

Steven P. Ruden
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 9/23/2008 appealing from the Office action mailed 6/7/2007.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

Related matters include reexamination 90/008,971, an ex parte reexamination, of U.S. Pat. No. 5,818,630 (having the same inventors as this application and being incorporated by reference in this application), and a litigation in Northern District f Virginia (Case No. 2-06-cv-15139) related to said patent.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to Be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

US Pat. App. # 09/199,728	FERMANN-II	08-2001
5,627,848	FERMANN-III	05-1997
5,422,897	WYATT	9-1995
5,074,633	COHEN	12-1991
"V-Groove Side Pumped 1.5 micron Fiber Amplifier," CLEO-1996 paper	GOLDBERG	4-1996
5,696,782	HARTER	12-1997
5,815,307	ARBORE	09-1998
Fiber-Laser Based Femto-Second Parametric Generator in Bulk Periodically Poled LiNBO3," Optics Letter, 1997	GALVANNAUSKAS-II	01-1997
"Saturable Absorber Modelocked Polarization Maintaining Erbium-Doped Fibre Laser," Electronics Letter, 1993	DE SOUZA	03-1993
"All-fiber Femto-Second Pulse Amplification," Applied Physics Letter, 1995	GALVANAUSKAS-I	02-1995
Federal Standard FS-1037C		

(Telecommunications:

Glossary of

Telecommunication Terms)

6,275,512	FERMANN-IV	08-2001
4,832,437	KIM	05-1989
Efficient Laser operation with nearly Diffraction-limited …, Optics Letter, V. 221, pp. 266-268.	GRIEBNER	02-1996

(9) Grounds of Rejection

The following ground(s) of rejection and objection from the 6/7/2007 Final Office Action are applicable to the appealed claims:

DETAILED OFFICE ACTION

Objection to the 12/21/2006 Amendment – New Matter

2. The amendment filed on 12/21/2006 is objected to under 35 U.S.C. § 132(a) because it introduces new matter into the disclosure of the invention by way of amending paragraph [0047]. Amended paragraph [0047] introduces new matter because it lacks support in the originally filed disclosure of the invention. Specifically, the originally filed disclosure of the invention discloses neither "V-values higher than 2.5 and relatively high index differences between core and cladding (i.e. a [delta] n > 0.3%) can be effectively employed [for the fiber 13]," nor "the number of modes [in fiber 13] is preferably in the range of 3 to 3000 and more preferably in the range of 3 to 1000."

Although the language objected to as new matter [hereinafter "QLOTANM"] forms part of the U.S. Pat. No. 5,818,630 to Fermann et al. [hereinafter "Fermann I"], the QLOTANM is

being introduced into this application (and now claimed) in a context neither disclosed by Fermann I, nor disclosed by this application.

The QLOTANM introduced by the amendment refers to fiber 13 is evidenced by the context of paragraph [0047], which describes fiber 13 (see, for example, the sentence before and the sentence after the quoted language introduced by the amendment; see, also newly added claims 63 and 65, directed to the quoted language introduced by the amendment). Fiber 13 forms part of the oscillator of the laser this application is directed to. On the other hand, the QLOTANM disclosed in Fermann I is directed to a fiber forming part of an amplifier. And as Applicants well recognize and argue (see, for example, the second paragraph of Applicants response disputing Double Patent Rejection of claim 1 of this application over claim 25 of Fermann I) an amplifier is different than a laser. Absent disclosure in this application that a characteristic of a fiber making part of the laser disclosed by this application is the same as the characteristic of a fiber forming part of an amplifier not disclosed for use with the laser, Applicants' amendment introduced new matter.

35 U.S.C. § 132(a) prohibits any "amendment [from] introduc[ing] new matter into the disclosure of the invention." Accordingly, Applicants are required to cancel, in the reply to this Office Action, the new matter introduced by the amendment to the specification.

Objection to Labeling this Application a "Continuation

3. A continuing-in part (but not continuing) application may disclose or claim, or both, subject matter not in a parent application. See, for example, 37 CFR § 1.53.

Examiner notes that presenting language from Fermann I (wherein Fermann I was incorporated in paragraph [0009] forming part of the Background of The Invention and directed to Background Relating to Optical Amplifiers) as if that language is directed to a fiber forming part of the oscillator of the laser of this application, introduces new matter in the present application. This application therefore cannot be a "Continuation" application of U.S. Patent Application 09/199,728 [hereinafter "Fermann II"]. Examiner notes that this application lacks pendency with Fermann I and therefore this application could be neither a "Continuation" (or

Continuation-In-Part) nor "Divisional" of Fermann I and, apparently, Applicants do not claim it to be so.

Moreover, Examiner notes that the claims are also objected to as presenting new matter in light of the disclosure.

To label this application a "Continuation" of Fermann II, Applicants therefore must cancel the material directed to the Fermann II disclosure not in the Background Relating to Optical Amplifiers of this Application's disclosure.

Any claim in the present application not supported by the disclosure or claim(s) of a parent application will have an effective filing date equal to the date introducing the matter objected to (12/21/2006). Any claim in the present application fully supported under 35 U.S.C. § 112 by a parent application will have the effective filing date of the parent application. See, for example, M.P.E.P. § 706.02 V.

Claim Rejections - 35 U.S.C. § 112

4. Claims 63-65 are rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. These claims contain subject matter not described in the specification as originally filed in such a way as to reasonably convey to one skilled in the relevant art that Applicants, at the time the application was filed, had possession of the claimed invention.

5. Claim 35 depends from claim 34, which no longer exists because it has been cancelled. Scope of claim 35 therefore is indefinite.

Correction is required.

Claim Rejections - 35 U.S.C. § 102

7. Claims 1, 7, 8, 17, 18, 34-39, 46, 50, and 62-65 are rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Pat. No. 5,422,897 to Wyatt et al. [hereinafter "Wyatt"]. Federal Standard FS-1037C (Telecommunications: Glossary of Telecommunication Terms) is presented to show definition of some terms in the technological arts.

With respect to Claims 1 and 46:

As to claim interpretation: Cladding is broadly read to include a region having index of refraction that is lower than what it surrounds. See, for example FS-1037C defining "cladding." And Wyatt discloses such regions. See, for example, the regions around the central portions of fibers 1 and 2; these regions would have lower higher indexes of refraction lest guiding/confining of light fails.

As to art rejection: Wyatt discloses a multi-mode fiber 1 having a cladding and doped with a gain medium; a pump 3 coupled to the cladding and exciting the gain medium; an optical guide 2 confining light preferentially to the fundamental mode of the multi-mode fiber 1.

Wyatt also discloses the fiber 1 including a core with the gain medium concentrated centrally within the core.

Wyatt discloses the coupling efficiency from the pump 3 to the multi-mode fiber in practical terms being about 50%. See, for example, column 6, lines 6-9. Surely, and a portion of what is not coupled into the multi-mode fiber would be coupled into the cladding around the multi-mode fiber. As "a pump … for exciting said gain medium," examiner notes that the "for exciting …" is intended use language not necessarily narrowing the limitation pump. Additionally, whether pump 3 couples into the multi-mode-fiber directly or indirectly (by way of the pump portion coupled into the cladding and then coupled into the multi-mode fiber), the pump 3 Wyatt discloses excites the gain medium.

With respect to Claims 7, 8, and 36:

Wyatt discloses a single-mode fiber 2 that inherently acts as a mode filter because it guides a single mode. And the single-mode fiber 2 is fusion spliced to the multi-mode fiber 1.

With respect to Claim 17:

Wyatt discloses a pair of reflectors (g1, g2).

With respect to Claim 18:

Wyatt discloses one of the pair of reflectors (g2).

With respect to Claims 34 and 35:

Wyatt discloses the optical guide comprising an optical fiber doped with an amplifying medium (the mode stripper 104). The mode stripper 104 includes a gain/amplifying medium concentrated centrally. With respect to claim 35, the recitation "fraction of the core" (attendant with the 112 rejection above) has a scope broad enough to read on the single mode (SM) fiber 2 and the multi-mode (MM) fiber 1; in either case, the gain medium in Wyatt is concentrated centrally within a fraction of the core of the cladding. Additionally, it is also noted that the recitation "fraction" has a scope including the "whole."

With respect to Claims 37-39:

Wyatt discloses the SM fiber 2 acting as a mode-filter because it is a single mode fiber guiding the fundamental mode of the M fiber 1. And the SM fiber 2 has a gain medium, which excites the fundamental mode of the MM fiber 1. The recitation of "an efficiency of at least 90%" is always true because it lacks a comparison for the efficiency number to have a limited scope; accordingly, its scope includes the efficiency being compared with the gain medium exciting the fundamental mode, which is 100% of its function.

With respect to Claim 50:

Wyatt discloses a grating g1 written on the MM fiber 1, which grating g1 reflects primarily the fundamental mode of MM fiber 1.

With respect to claims 62-65:

Fermann III [sic] (instead it is Wyatt discloses the features recited in claims 62-65.

For example, the fiber core is disclosed as multi-mode. And according to Applicants own admission, a multi-mode core has a v-value of greater than about 2.5. Moreover according to FIG. 5-17, a multi-mode cored fiber propagates at least three modes, these including the fundamental mode and the nearly overlapping TM and TE and HE modes).

Claim Rejections - 35 U.S.C. § 103

13. Claims 2-6, 19, 20, 21, and 30 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Wyatt in view of Fermann III, as motivated by "Saturable Absorber

Modelocked …," by De Souza, et al., Electronics Letters, 29 (1993) pp. 447-449 [hereinafter "De Souza"].

Fermann III discloses modelocking to initiate production of short pulses (see, for example, claim 10). And De Souza discloses using InGaAsP on InP substrate as the passive modelocker because it has both fast and slow recovery mechanism (see, for example, De Souza, the paragraph below FIG. 3 on page 448). And the result of fast recovery due to InGaAsP is mode-locked pulses shorter than 500 pico-second.

To initiate production of short pulses by a mechanism having short and fast recovery, therefore, it would have been obvious to modify the disclosure of Wyatt by including modelocking by InGaAsP.

14. Claims 16, 22-26, 31-33, 40, and 41 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Wyatt in view of Fermann III.

With respect to claims 16, 22-26, 31-33:

Fermann III discloses these features to compensate for linear and non-linear phase drifts. See, for example, claims 6, 7, 9, and 12.

To compensate for linear and non-linear phase drifts therefore it would have been obvious to modify the disclosure of Wyatt by the disclosure of Fermann III.

With respect to claims 40 and 41:

Fermann III discloses using a length of a single mode fiber having positive dispersion to compensate for the negative dispersion that might exist. To compensate for negative dispersion therefore it would have been obvious to modify the disclosure of Wyatt by the disclosure of Fermann III.

15. Claims 55, 57, 59-61, and 66 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Wyatt in view of Fermann III or in view of U.S. Pat. No. 4,832,437 to Kim et al. [hereinafter "Kim"].

Fermann III discloses that bending the fiber 101 minimizes non-linear polarization changes. To minimize non-linear polarization changes therefore it would have been obvious bend the multi-mode fiber.

Alternatively, Kim discloses coiling multi-mode fiber to strip light in higher order modes without striping light in the fundamental mode. See, for example, column 5, lines 39-45. To strip away higher order modes therefore it would have been obvious to coil (which inherently includes bending) the multi-mode fiber.

The single mode fiber disclosed in Wyatt filters the light.

16. Claim 59-61 and 66 is also rejected under 35 U.S.C. § 103(a) as being unpatentable over Wyatt in view of Fermann III.

Fermann III discloses that coiling the fiber onto a 3.5 drum achieves efficient absorption of skew rays from the pump. To achieve efficient absorption of skew rays from the pump beam therefore it would have been obvious make the multi-mode fiber have a coil.

17. Claim 56 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Wyatt in view of Fermann III or Kim, further in view of Fermann III.

Fermann III discloses modelocking to initiate production of short pulses (see, for example, claim 10).

To initiate production of short pulses therefore it would have been obvious to modify Wyatt, as modified by Fermann III or Kim, by including mode-locking.

18. Claims 9-11 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Wyatt in view of Cohen.

Cohen discloses fusion splicing and tapering different fibers, which tapered splicing results in taper regions substantially free of constrictions and a splice having relatively low optical losses. See, for example, the Abstract and the figure as shown on the front page of Cohen. Because of continuity at the splice, tapering will occur in both fibers.

To obtain taper regions substantially free of constrictions and a splice having relatively low optical losses therefore it would have been obvious to fusion splice the multi-mode and single mode fibers.

19. Claims 13-15 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Wyatt in view of Goldberg.

Goldberg discloses v-groove side pumping to keep the fiber ends unobstructed and be able to use multiple pumping sites (thus increase the pumping power. See, for example, the second paragraph of Goldberg describing the method's advantages. Additionally it is noted that the coupling is optical.

To keep the fiber ends unobstructed and increase the pumping power therefore it would have been obvious to use v-groove side pumping.

20. Claim 42 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Wyatt in view of view of Fermann III, further in view of Harter I or Galvanauskas I.

It is well known that single mode fibers are sensitive to peak powers. It is also well known to use output couplers (the scope of recitation "output coupler" is treated broadly to include elements before and after the output coupler) limiting the power in single mode fibers to protect them. See, for example either of Harter I (FIG. 4) or Galvanauskas I. To protect the single mode fiber therefore it would have been obvious to use an output coupler to reduce the peak power.

Additionally, since reducing the power is art recognized result-effecting variables/parameters, as per established patent law precedent (see, for example M.P.E.P. § 2144.05) therefore it would have been obvious to optimize (for example by routine experimentation) the peak power in the single mode fiber to be less than 10% of the peak power in the cavity to protect the single mode fiber by reducing the peak power.

21. Claims 43-45 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Wyatt in view of Fermann III further in view of either Harter I or Galvanauskas I, further in view of Arbore and Galvanauskas II.

Arbore discloses using a LiNbO3 having chirped grating to simultaneously chirp adjust (and thus compress) and frequency double ultra-short pulses. See, for example the

front page. Arbore also recognizes the importance of both compressing pulses and controlling their frequency. Both Arbore and Galvanauskas II recognize the benefit of using periodically poled LiNbO3 for harmonic generation because of its large nonlinear coefficient.

To simultaneously chirp adjust (and thus compress) and frequency double pulses using a large non-linear coefficient (and therefore an efficient) material therefore it would have been obvious to modify the combination of Wyatt with Fermann III with Harter I, or with Galvanauskas I, to use PPLN as a frequency doubler and a pulse compressor.

Response to Applicants' Arguments

25. Applicant's prior arguments have been considered, but they are found non-persuasive.

Applicants argue that Fermann III discloses a single mode fiber, whereas the claims recite multi-mode fiber.

Examiner notes that there is no recitation addressing core size or characteristic at least in independent claims 1 and 55. And Examiner notes that the prior art well recognizes the existence of cladding modes in oscillator and the need to strongly attenuate them. And therefore the reasonableness of interpreting multi-mode as including such modes. See, for example, Fermann III, column 4, lines 56-66. See, also Kafka, cited above in the 102 rejection.

Examiner moreover notes that the claims do not reflect the narrow scope Applicants argue for. Indeed, new claims (in addition to them introducing new matter) clearly show that the scope of "multi-mode" as recited in the claims is not necessarily limited to the core being multi-mode, as opposed to the whole fiber being multi-mode. See, for example, at least claim 62, limiting independent claim 1 by reciting the v-value being greater than about 2.41. Under the Doctrine of Claim Differentiation therefore claim 1 must have a scope broader than the further limited claim 62.

Applicants also argue that Wyatt fails to anticipate because it fails to disclose pump coupled to cladding for exciting the gain medium.

Examiner notes that Wyatt explicitly discloses that coupling efficiency to the core is 50%, which entails 50% not coupling to the core. This disclosure includes disclosing a portion of the 50% not coupling to the core coupling to the cladding surrounding the core.

Admitting that Cohen discloses single mode fiber fusion splicing to another single mode fiber, Applicants argue that Cohen fails to remedy the deficiency because it fails to disclose fusion splicing multi-mode fiber to single-mode fiber.

Examiner notes that the Cohen discloses and motivates fusion-splicing fibers having different (significantly different) core diameters. And Cohen's disclosure and motivation would carry over to the broadly recited claims (in this application) wherein the multimode nature of modes is not limited to the core.

Applicants also argue that Goldberg fails to disclose v-groove side pumping a multi-mode fiber.

Again, Examiner notes that that the claims are not limited to the fiber core being single mode. And that Goldberg discloses and motivates v-groove side pumping the fiber, which includes a cladding and a core (the cladding and the core well recognized in the as supporting multi-modes).

Recognizing that De Souza discloses mode-locking single-mode fibers, Applicants argue that it does not disclose mode-locking multi-mode fibers. As part of their argument, and citing paragraph [0031] of this application, Applicants stress that mode-locking of a multi-mode fiber was considered "impossible."

In response, Examiner first notes that Applicants disclose in paragraph [0031] that "stable" mode-locking was not demonstrated. This disclosure includes the tacit admission that unstable mode-locking was demonstrated. Moreover, Examiner also notes that the claims are not limited to "stable" versus unstable mode-locking.

As to De Souza, Examiner notes that the claims of this application are not limited to the fiber core being multi-mode as opposed to the whole fiber supporting plural modes.

Applicants also argue that Wyatt teaches away from bending.

In response Examiner notes that Wyatt discloses bending of fibers having length greater than 1 m as being undesirable. First, Examiner notes that Applicants argue that Wyatt discloses the undesirability (as opposed to the impossibility). Second, Examiner notes that Wyatt expressly discloses that the fundamental mode propagates for distances up to one meter, if the fiber is nominally straight, without significant coupling of power into the higher order modes. This is not teaching away.

Moreover, Examiner notes that Wyatt explicitly discloses that using Yb allows for higher gain at shorter length and therefore avoid issues related to length.

Recognizing that Kim discloses stripping the second order mode without affecting the first order mode, Applicants argue that Kim does not disclose placing a fiber in a cavity. In response, Examiner notes that Kim is introduced as disclosing and motivating stripping of higher modes. And as Applicants recognize, it does disclose and motivate this feature.

And recognizing that Kim discloses stripping the second order mode without affecting the first order mode, Applicants argue that it fails to disclose stripping higher than second order modes.

First, Examiner notes that Applicants are not arguing a feature recited in a claim. Second, Examiner notes that Applicants are arguing reasonable expectation of success.

In response, Examiner notes that there would be a reasonable expectation of success that modes having order higher than the second order would be stripped if the second order mode were stripped.

(10) Response to Arguments

With respect to the rejection of claims 63-65 under 35 U.S.C. 112, first paragraph as failing to comply with the written description requirement starting on page 13 of the Appeal Brief, and the Objection to the Specification as presenting New Matter, starting on page 16 of the Appeal Brief, generally pointing to the Abstract and column 5, lines 4-8, Appellant contends that Fermann I provides support to physically incorporating (many years after filing the application) the added subject matter into the specification and claims of the present application.

Examiner notes that patent law precedents make clear that proper incorporation by reference requires "the host material [to] identify with *detailed particularity* what specific material it incorporates and *clearly indicate where* that material is found in the various documents." See, for example, Zenon Environmental v. US Filter 506 F3rd 1370 (Fed. Cir. 2007; Ns. 2006-1266, 1267)

In the instant case, this Application originally mentioned Fermann I in the BACKGROUND OF THE INENTION only, in page 2, line 16, see, for example, paragraph [0009] of the PGPUB corresponding to this application. And the reference to Fermann I is only to state: "More recently, the amplification of pulses to peak powers higher than 10 KW has been achieved in multi-mode fiber amplifiers."

This hardly qualifies as an identification with detailed particularity to explicitly amend (more than five years after filing the application) the specification (the first paragraph on page 9 of the specification, paragraph [0047] of the PGPUB corresponding to this application, and the claims, so that the length of multi-mode optical fiber has a V-value greater than about 2.41, as now claimed in claim 63, or that the length of the multi-mode optical fiber is capable of supporting a number of propagating modes between 3-3000, or 3-1000, respectively, as now claimed in claims 64 and 65.

The incorporation by reference therefore does provide proper incorporation by reference to support amending the specification and claims to support and present claims 64-65. Amending the specification and adding claims 64-65 therefore adds new matter in violation of 35 U.S.C. 132. Absent the amendment to the specification, additionally, claims 63-65 violate 35 U.S.C. 112, first paragraph, as lacking written description.

With respect to the rejection of claim 35 as being indefinite under 35 U.S.C. 12, second paragraph, starting on page 17 of the Appeal Brief, Appellant admits that the rejection is appropriate.

With respect to rejection of claim 1 as being anticipated by Wyatt, starting on page 24 of the Appeal Brief, Appellant argues: "Wyatt does not disclose pump light coupled to the cladding,

but rather pump light that is coupled to the multi-mode core of a single-clad fiber. (Wyatt, col. 1, lines 56-62; and col. 4, lines 52-64)."

In making this argument, Appellant recognizes that Wyatt discloses a coupling efficiency to the core of about 50% (see, for example, the second full paragraph on page 25 of the Appeal Brief). Appellant nevertheless argues that well-known optical losses including absorption, reflection, refraction, diffraction, scattering, optical misalignment will lead to inefficient coupling of the pump light to the intended target (i.e. the core). And Applicant therefore argues that any (or all) of these known optical losses may account for Wyatt's 50% core coupling efficiency."

This argument miss-describes the scope of the claimed language. The claimed language is "a pump coupled to said cladding." This language has a scope including any part of the pump being coupled to the cladding, whether or not part of the pump is coupled to the core. And Wyatt anticipates this limitation.

As Appellant expressly recognizes, Wyatt discloses 50% of the pump being coupled to the core. The remaining 50% therefore is not coupled to the core. Wyatt does not disclose 50% pumping efficiency. Rather, Wyatt discloses 50% coupling from the LDA into the multimode fiber waveguide. Specifically, in column 6, lines 6-19, Wyatt discloses:

> In practical terms, the coupling efficiency from the LDA into the multimode fibre waveguide portion is about 50%: custom-made arrays of the required type being obtainable from Spectra-Diode Labs.
>
> Assuming a coupling efficiency of 50%, the power requirement for the LDA can be estimated quite easily. For example, to provide a 0.5 W laser output from the present laser (which could be used as a high power pump source suitable for use with a fibre laser amplifier), it is predicted that between 1 and 1.5 W of power would be required in the multimode waveguide portion. 50% coupling efficiency from the LDA means that the LDA would need to provide at least 3 W of optical power.

Clearly therefore whatever is not coupled into the multimode fiber in Wyatt is coupled to outside of the multimode fiber, and that outside includes the cladding, which adjoins the multimode fiber (i.e., the multimode core) and therefore is in the way of the portion of the pump not coupling into the multimode fiber, which, therefore, results in "the pump being coupled to said cladding," as recited in claim 1.

With respect to rejection of claims 7, 8, 17, 18, 35-39, 46, 50, and 62-65 as being anticipated by Wyatt, starting on page 26 of the Appeal Brief, Appellant fails to present any argument for why their specific limitations render the claims allowable. These claims therefore stand and fall based on the propriety of Wyatt anticipating claim 1.

With respect to claims 2-6 and 19-21 as being obvious over Wyatt in view of Fermann III and De Souza, starting on page 30, Appellant notes that they depend from claim 1 and therefore are allowable because of the contended failure of the applied prior art to disclose "the pump being coupled to said cladding," as recited in claim 1.

Additionally, starting in the second full paragraph on page 30, Appellant notes that the laser of claims 2-6 and 19-21 comprises a mode locking mechanism, and recognizes that Fermann III and De Souza discloses modelocking the laser s they disclose. Appellant however argues that there is no reasonable expectation of success for using the mode locking disclosed by Fermann III and De Souza in the laser Wyatt Discloses.

In making this argument, Appellant emphasizes that Wyatt discloses a multi-mode fiber and emphasizes that the modelocking of Fermann III and De Souza is in the context of single mode fibers. The Appellant therefore contends that there is no reasonable expectation of success. Citing the Application, page 6, lines 29-31, Appellant emphasizes that this "application teaches that the stability of modelocking depends on reducing spurious reflections in the oscillator, which are conceptually equivalent to mode-locking in multi-mode fibers."

These assertions however reflect neither the disclosures of Wyatt nor that of this application.

Specifically, this application discloses using a single mode fiber 15 connected to a multimode fiber 13. See, for example, the front-page, and page 8, lines 15-30 of this application,

and paragraph [0047] of the PGPUB corresponding to this application. Wyatt however also discloses this specific arrangement of single and multimode fibers. See, for example, fibers 1 and 2 as specifically labeled "multi-mode fibre" and mono-mode fibre," respectively, in any of FIGs. 1 and 2, and see column 4, lines 60-64. This application discloses insuring the operation of the single mode fiber 15 as a mode filter. See, for example, the last sentence of paragraph [0047] of the PGPUB of this application, corresponding to page 8, lines 27-30 of the specification of this application. Wyatt however also discloses using the single mode fibre 2 as a filter to insure lasing in the fundamental (single) mode of the multi-mode of the laser. See, for example, column 8, lines 15-55. Accordingly, both this application and Wyatt disclose using a single mode fiber along with a multi-mode fiber, wherein the single mode fiber acts a filter to insure single (fundamental mode) lasing of the system.

As to the contented teaching of page 6, lines 29-31, of this application and the contended lack of reasonable expectation of success, Examiner notes that it contradicts the very same disclosure of this application, admitting that mode-locking is achieved in multimode fiber lasers. Namely, "Efficient laser operation with nearly diffraction-limited …," by Griebner, Optics Letters, Vol. 21, pp. 266-268 (1996), explicitly incorporated by reference by this application on page 6, line 24, specifically discloses in the last sentence of the first paragraph on the left hand column of page 266, that modelocking of multimode fiber lasers are achieved. Indeed Griebner refers to reference 7, published in 1994, as disclosing the modelocking multimode fiber lasers.

As to whether one of ordinary skill in the art would have a reasonable expectation of success considering the prior art, Examiner notes that one of ordinary skill in the art would note: that Fermann III and De Souza disclose modelocking of single mode operating lasers; that Wyatt disclosed multimode laser system has "a highly predominant fundamental oscillation, [and that] oscillation is stimulated in the fundamental mode only," see column 8, lines 35-39, and therefore operating in the single mode; that the Wyatt disclosed "laser system [can] approach 100% quantum efficiency and [be] limited only by guide imperfections and mismatch and mismatch between the guides and loss mechanism in the doped fibre;" and, that, as admitted by the application in view of the incorporating Griebner by reference, multimode fibers have been modelocked. One of ordinary skill in the art would therefore have at least a reasonable

expectation of success that the system Wyatt discloses (a laser system including a multimode fiber and a single mode fiber, the laser system operating in the single mode) would be modelocked when incorporating a modelocking means.

With respect to claim 30 as being obvious over Wyatt in view of Fermann III and De Souza, starting on page 32, Appellant argues that the combination of references fails to show the "ultra-short optical pulses are 'preferentially in the fundamental mode of said multi-mode optical fiber.'"

In response, Examiner notes that claim 30 does not recite the optical pulses "are preferentially in the fundamental mode." Rather claim 30 recites "wherein said ultra-short optical pulses preferentially in the fundamental mode of said multi-mode optical fiber have a pulse width below 500 psec."

Regardless, Examiner notes that Wyatt discloses the lasing to be in the fundamental mode only (see, for example, Wyatt, column 8, lines 35-39), and modelocking would not change the mode of the lasing because there is no lasing in other modes.

In the interest of completion, however, Examiner additionally notes that Fermann III (a patent issued to the Appellant and another) specifically discloses modelocked pulses to be 560 fsec, and therefore less than 1 psec, in pulse width. See, for example, FIG. 2A, and column 3, lines 38-40.

With respect to claim 16, 22-26, 31-33, 40, and 41, as being obvious over Wyatt in view of Fermann III, starting on page 33, Appellant fails to present any argument for why their specific limitations render the claims allowable. These claims therefore stand and fall based on the propriety of Wyatt anticipating claim 1.

With respect to claim 55, as being obvious over Wyatt in view of Fermann III or Kim, Appellant cites Wyatt col. 7, lines 1, 4-5, and 57-60, and argues that Wyatt "strongly teaches away" from bending multimode fibers "because bent multi-mode fibers causes 'significant coupling of power into higher order mode.'"

In response, Examiner notes that contrary to "strong[ly] teaching away," as contended by Appellant, Wyatt specifically discloses:

> The applicants have discovered that the fundamental mode of a multimode fibre can propagate down a multimode fibre for distances of up to one meter, if the fibre is nominally straight, without there being significant coupling of power into higher order modes. (column 7, lines 1-5; underlined by Examiner for emphasis)
>
> ...
>
> With a level of ytterbium between 0.5 and 5.0 weight % the length of the multimode fibre would typically not need to be as great as 1 meter, and thus fibre length is not a significant constraint in terms of performance reduction for the present system. (column 7, line 67 to column 8, line 3; underlined by Examiner for emphasis)

One of ordinary skill in the art reading this disclosure by Wyatt recognizes that Wyatt is disclosing that lengths shorter than 1 meter can be used wherein "fibre length [becomes] not a significant constraint in terms of performance reduction." And, moreover, one of ordinary skill in the art would recognize that, in this situation (wherein a level of ytterbium between 0.5 and 5.0 weight % is used) fibers need not be nominally straight since their length is less than 1 meter. Wyatt's disclosure therefore specifically discloses how one might use a nominally straight fiber when longer than 1 meter, and how not to be limited by length and its desirable nominally straight condition.

Wyatt's disclosure therefore is combinable with both Fermann III and Kim, thus rendering obvious claim 55.

With respect to claim 55, additionally, Appellant recognizes that Fermann III fails to disclose a multi-mode fiber and therefore the combination of Wyatt and Fermann III fails to disclose bending a multi-mode fiber.

In response, Examiner notes that Appellant is arguing that Wyatt and Fermann III are separately not anticipatory. Examiner notes that the rejection is obvious over Wyatt in view of

Fermann III. Wyatt discloses the multi-mode fiber laser and Fermann III disclose being a fiber for a specific purpose.

With respect to Kim, Appellant additionally argues that it does not disclose using it in a laser cavity. Again, Appellant is arguing that the references individually are not anticipatory. Examiner notes that Kim is evidence that bending a multimode fiber strips away higher order modes without affecting the fundamental mode. It is introduced, along with its disclosed motivation, to modify Wyatt and thus demonstrate that the claim 55 would be obvious over the combination of Wyatt and Kim.

Additionally, with respect to claim 55, Appellant argues that Kim does not teach bending for the same purpose as recited in the claim 55. In response, Examiner notes that patent law precedents make clear that purpose other than that wished for by an inventor may be used to demonstrate why a claim would have been obvious by one of ordinary skill in the art modify a base reference by the teachings of a secondary reference. A recited purpose in a device or method claim fails to limit the claim unless the purpose itself is limiting. In claim 55, the recitation of "bent multi-mode fiber" fails to recite a purpose let alone reciting it as a limitation.

Additionally, recognizing that Kim discloses stripping away second order modes, Appellant argues there is not expectation of success when used in a laser cavity having many higher order modes. In response, Examiner notes that Wyatt already discloses the laser operating in nearly fully fundamental mode. One of ordinary skill in the art would have had a reasonable expectation of success that using Kim would result in a better fundamental mode efficiency by stripping away the first higher order mode, wherein the modes higher still are already nearly non-existent. Examiner notes that claim 64 is not relevant as it depends from claim 1, not claim 55.

With respect to claims 57 and 66 as being obvious over Wyatt in view of Fermann III or Kim, starting on page 36, Appellant fails to present any argument for why their specific limitations render the claims allowable. These claims therefore stand and fall based on the propriety of Wyatt anticipating claim 55.

With respect to claims 59-61 and 66, as being obvious over Wyatt in view of Fermann III or Kim, starting on page 37, Appellant alleges that the applied prior art fails to disclose bending or coiling.

This allegation contradicts Appellant's specific recognition that Kim discloses bending and motivates it. This allegation also contradicts Appellant's own argument in this section, wherein it is recognized that Fermann III discloses and motivates coiling. See, for example, the first sentence in the second paragraph on page 37 of this appeal.

Appellant's contention that Wyatt strongly teaches away from bending is dealt with earlier in addressing the argument first presented in this appeal with respect to claim 55 and shown to lack merit.

With respect to claim 56, as being obvious over Wyatt in view of Fermann III or Kim, further in view of Fermann III, starting on page 37, Appellant argues that mode-locking is not demonstrated and was thought to be impossible. Examiner notes that this argument is dealt with in responding to the argument for why claims 2-6 and 19-21 would not have been obvious over Wyatt in view of Fermann III and De Souza.

With respect to claims 10-11, as being obvious over Wyatt in view of Cohen, starting on page 38, Appellant fails to present any argument for why their specific limitations render the claims allowable. Rather the argument is that Cohen fails to disclose "a pump coupled to said cladding." Examiner notes that Wyatt discloses the recited feature, as shown in the response to the argument for why Wyatt fails to anticipate claim 1.

With respect to claims 13-15, as being obvious over Wyatt in view of Goldberg, starting on page 38, Appellant argues that claims 13-15 are allowable by virtue of claim 1 being allowable—since claim 1 allegedly fails to disclose a pump coupled to said cladding." As Examiner explained above, Wyatt discloses a pump coupled to the cladding and claims 13-15 therefore are similarly not allowable.

Appellant also argues that Wyatt teaches away from coupling the pump to the cladding because allegedly "Wyatt describes an example of a cladding-pumped double-clad fiber in which pump light is launched into an elliptical outer cladding of the fiber. (Wyatt, col. 2, lines 3-10).

Wyatt describes the arrangement as having 'an extremely complex structure, which makes fabrication very difficult.' (Wyatt, col. 2, lines 6-7). Performance is "highly dependent on launch conditions" which are described as being "complicated." (Wyatt, col. 2, lines 8-10). To avoid these difficulties, Wyatt pumps light into the high-NA core of a multi-mode fiber. (Wyatt, col. 1, lines 59-62 and col. 5, lines 23-25)." See, for example, page 39 of the Appeal Brief.

In response, Examiner notes that the Appeal Brief quotes Wyatt out of context. Wyatt is describing a prior art method of generating single mode lasing in a multi-mode fiber. Specifically, in column 1 line 67 to column 2 line 10, Wyatt states:

> One form of waveguide arrangement which is able to use a multimode pump source to produce a substantially monomode output is the `Polaroid` type optical fibre, available from the Polaroid Corporation.
>
> This arrangement consists of an elliptical outer core, which is undoped, into which the pump input is launched, and an inner, circular, doped core. However, this arrangement has an extremely complex structure, which makes fabrication very difficult. Also, performance is highly dependent on launch conditions of energy into the fibre, which are complicated, again, by the shape of the outer core.

Wyatt's characterization as "an extremely complex structure, which makes fabrication very difficult" is directed to the elliptical outer core (which is the cladding), not the launching of the pump into the outer core. Note specifically the last sentence wherein Wyatt notes that the shape (elliptical) of the outer core (that is the cladding) is what complicates the launching. Indeed, in column 1, lines 11-29, Wyatt notes that single pump sources have been used to obtain monomode output in lower power and plural sources have been used to obtain higher power, including pumping "along the length of a fiber laser cavity." See, for example, column 1, lines 26-29.

One of ordinary skill would recognize therefore that Wyatt teaches away from using an elliptical cladding, not from launching a pump into the cladding.

One of ordinary skill in the art notes that Goldberg teaches using side pumping and motivates it (specifically, Goldberg discloses v-groove side pumping to keep the fiber ends unobstructed and be able to use multiple pumping sites thus increasing the pumping power. See, for example, the second paragraph of Goldberg describing the method's advantages). One of ordinary skill in the art at the time of the invention therefore would find it obvious to modify the disclosure of Wyatt to include a v-groove to side pump the multi-mode fiber Wyatt discloses.

With respect to claims 43-45, as being obvious over Wyatt in view of Fermann III, further in view of either Harter I or Galvanauskas I, further in view of Arbor and Galvanauskas II, starting on page 40, Appellant argues that claims 43-45 are allowable by virtue of claim 1 being allowable—since claim 1 allegedly fails to disclose a pump coupled to said cladding." As Examiner explained above, Wyatt discloses a pump coupled to the cladding and claims 43-45 therefore are similarly not allowable.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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